

## **University of Cincinnati**

### **University of Cincinnati Education and Research Center**

#### **Annual Report**

**Reporting Period: July 1, 2013 – June 30, 2014**

**Principal Investigator: Tiina Reponen, PhD**

## **SECTION I**

### Summary:

The purpose of the University of Cincinnati Education and Research Center is to provide an excellent interdisciplinary educational environment for graduate students in core (Occupational Hygiene, Occupational Health Nursing, Occupational Medicine Residency and Occupational Safety and Health Engineering) and component (Biomonitoring) training programs, support the development of research skills through Pilot Research Program (PRP) and Targeted Research Training (TRT) program; encourage innovative and interdisciplinary research to identify causal relationships between exposure and illness or injury, design control strategies and evaluate the effectiveness of interventions; deliver continuing education, consultation and outreach to address environmental and occupational safety and health needs through regional partnerships; and advocate the translation of research findings into practice regionally, nationally and internationally. This is accomplished through a collaboration of faculty from three colleges: College of Medicine, College of Nursing and College of Engineering and Applied Science. The ERC leadership seeks input from an External Advisory Board, which represents key stakeholders.

Academic program trainees have been accepted into MS and PhD graduate programs in their respective Colleges and Departments. Non-academic program trainees in the PRP represent graduate students, junior faculty or senior faculty transitioning into occupational safety and health. Trainees in Continuing Education and Outreach span the range of educational backgrounds and employment, as the program reaches practitioners in all disciplines as well as employees with health and safety responsibilities in diverse work settings. The TRT involves faculty and students in all academic programs to provide a safer and more healthful workplace in regionally important employment sectors: firefighters and emergency responders, low wage workers and health care workers. The PRP symposium and the Annual Topical Symposium are open to the community providing an opportunity for more than 100 professionals to interact with the investigators. The annual Research Capacity Building Workshop is offered for 15-20 junior investigators at PRP institutions.

Classroom and laboratory facilities are available in each College. Practicum locations are arranged with various employers. Substantial field work is done by all disciplines, utilizing local workplaces for walk-throughs, evaluation of potential work place exposures, multi-disciplinary workshop projects, research-to-practice projects and occupational medicine resident placements.

### Relevance:

Occupational injury and illness adds substantially to health care costs. The educational programs offered by the ERC prepare professionals to serve in their respective roles on the health and safety team – identifying hazardous exposures, reducing risk and treating injury and illness. Through outreach students translate research to practice and learn of the need for continuing education as part of life-long learning.

Key Personnel:

Center Director: Tiina Reponen ([Tiina.Reponen@uc.edu](mailto:Tiina.Reponen@uc.edu), tel. 513-558-0571)

Center Deputy Director: Amit Bhattacharya ([Amit.Bhattacharya@uc.edu](mailto:Amit.Bhattacharya@uc.edu), tel. 513-558-0503)

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Occupational Health Nursing Program Director: Susan Reutman ([reutmass@ucmail.uc.edu](mailto:reutmass@ucmail.uc.edu), tel. 513-558-5280)

Occupational Medicine Program Director: Andrew Freeman ([Andrew.Freeman@uc.edu](mailto:Andrew.Freeman@uc.edu), tel. 513-558-0038)

Biological Monitoring Program Director: Glenn Talaska ([Glenn.Talaska@uc.edu](mailto:Glenn.Talaska@uc.edu), tel. 513-558-0519)

Continuing Education Program Director: Amit Bhattacharya ([Amit.Bhattacharya@uc.edu](mailto:Amit.Bhattacharya@uc.edu), tel. 513-558-0503)

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Targeted Research Training Program Director: Tiina Reponen ([Tiina.Reponen@uc.edu](mailto:Tiina.Reponen@uc.edu), tel. 513-558-0571)

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## University of Cincinnati

### University of Cincinnati Education and Research Center Annual Program Highlights

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#### SECTION II: Center Highlights

##### Pilot Research Program (PRP)

Program Director: Amit Bhattacharya, PhD, CPE

PRP at the University of Cincinnati (UC) thrives in increasing the research capacity of research trainees and young investigators in occupational health and safety and encouraging those in related disciplines to pursue occupational health and safety research. Since 1999, the PRP program has awarded **over \$1.1 million** in pilot grants that have resulted in bringing over **\$34 million** in additional research support to the region. Additionally, it has facilitated the transition of **33 new investigators** from other disciplines to occupational health and safety field. The pilot projects have resulted in research-to-practice applications that help the surrounding community and open up new research avenues and collaborative linkages.

Below are examples of projects and their impact that were conducted during the past year.

- A post-doctoral research has shown that moisture damage in buildings is associated with respiratory health problems. This study will serve as a platform for understanding the fungal diversity specifically associated with moisture-damaged buildings and ultimately provide a better understanding of the source of these respiratory ailments. The standardization of next generation sequencing for moisture-damage-associated fungi will be useful for assessing fungal diversity and associated health outcomes among workers in many other workplaces, which are often damp and water damaged (e.g., dairy farms, greenhouses, poultry farms, grain storage buildings).
- A whole body computational heat stress model was developed by a mechanical engineering student. This model was designed to aid in determining the appropriate time of exposure to firefighting activity and compute the required cooling rate in cooling jackets for firefighters. This will, in turn, help limit heat-induced stress and avoid thermal shocks. Additionally, it will allow for determination of the performance of newer cooling technologies.
- A study conducted by a faculty in the School of Social Work, defined the exposure to environmental tobacco smoke (ETS) experienced by child welfare workers employed at Job and Family Services of Hamilton County (JFS), Ohio. The results of this study contribute to the need to develop strategies by child welfare workers to protect themselves from the ETS hazard.
- A student from the industrial psychology department conducted a study to investigate the effects of work-related breaks on psychological variables, specifically in the field of education. Education is the second largest industry in the nation with over 13.3 million workers (National Services Agenda, 2009). Preliminary findings support that perceived state energy in the morning has important implications throughout the day for teachers.

Further, relaxation as a recovery strategy in the evening was a predictor of next day indicators of well-being.

**Targeted Research Training (TRT)**  
**Program Director: Tiina Reponen, PhD**

The objective of the TRT program at UC is to offer interdisciplinary research training in the framework of developing and transferring emerging technologies and methods to improve firefighters' health and safety.

A mechanical engineering student under the guidance faculty from UC's NSF Nanotechnology Center, developed a finite element model of Carbon Nanotube fabric integrated into firefighter garments for evaluating carbon nanotube fabric's ability to protect the firefighters from the external heat while at the same time dissipate bodily heat. This unique thermally anisotropic property of carbon nanotube is being incorporated in prototype firefighter garment; if successful it will have significant impact in minimizing heat build-up during firefighting.

One doctoral student in the Occupational Hygiene program developed a data driven *Classification Tree model* using data from Live Firefighting study for predicting core body temperature of individual firefighters. This Classification Tree model was then utilized by another doctoral student to evaluate a unique intervention approach of *Pre-Cooling a firefighter* (before starting a live firefighting) for minimizing build-up of heat during firefighting.

A mechanical engineering student working under a faculty has developed a physiologically based 3D whole body model which can be used to predict core body temperature, sweat rate, cardiac output and stroke volume for firefighters.

Occupational Health Nursing students conducted focus group interviews to assess physical health in firefighters. The focus group analysis determined the firefighters were interested in an exercise that did not render them "spent" and unable to perform the required duties of firefighters. The data on focus group interviews with the firefighters has been published in the Workplace Safety and Health Journal and was utilized in the design of the currently ongoing exercise intervention.

**Outreach**  
**Program Director: Kermit Davis, PhD, CPE**

The UC-ERC has decided to employ CERKL as a far reaching outreach tool to provide timely information to the stakeholders in the region. CERKL is similar to a Linked-In or Facebook but with more customized towards educational programs. CERKL allows the programs of the ERC to post messages about the recent research, projects, and upcoming events. CERKL also will allow our stakeholders to provide resources back to our programs in the form of expertise and networking contacts. Stakeholder database has been built with rollout occurring soon.

**Occupational Health Nursing program (OHN)**  
**Program Director: Susan Reutman, RN, PhD**

Five OHN students completed their MSNs, one of whom will continue on in the OHN PhD program. There are, in addition, eight MSN students in our OHN program and a new Director, Dr. Susan Reutman.

The research of four OHN MSN students was presented by students at the annual conference of the American Association of Occupational Health Nurses poster sessions. Their faculty mentored research involved a health & wellness needs assessment and evaluation of an intervention targeting small business workers, specifically, entertainment and architecture firm workers. Improvements in awareness of healthy life choices were found among entertainment workers who received the educational intervention and among architects who received the education and conducted a FitBit® step activity (15% and 16.5%, respectively).

OHN students have also actively participated in the Targeted Research Training Program, both helping in the data collection for heat stress project and leading the project on exercise intervention.

**Occupational Medicine Residency  
Program Director: Andrew Freeman, MD, MS**

During the past year, the three physician graduates of the Occupational Medicine Residency received job offers for (and are currently working in) occupational medical positions in multiple regions of the country. One resident is directing pharmacovigilance projects for a multi-national pharmaceutical company in New Jersey. Another is the lead physician of an occupational medicine clinic in Maryland. The third is the Director of Occupational Medicine for a regional system of clinics in Ohio.

**Occupational Hygiene  
Program Director: Kermit Davis, PhD, CPE**

Five occupational hygiene students and faculty received awards at the 2014 American Industrial Hygiene Conference and Exposition in San Antonio, the largest annual gathering of industrial hygienists in North America.

Three of the awarded studies were part of the TRT program focusing on different aspects of respiratory protection of firefighters, first responders and first receivers to combustion aerosol hazards. The studies utilized novel real-time aerosol measurement techniques to quantify protection factors of different respirators through manikin-based experiments and tests involving firefighters. The findings have significantly enhanced the current understanding of respiratory protection against combustion aerosols, which will help improve present worker protection practices and build new strategies to mitigate ultrafine aerosol exposures.